

This manual is for the use of safely uninstalling and reinstalling Crosspoint Kinetics Components safely and properly. If you are not familiar with this manual or have not received any training from a Crosspoint representative please call Crosspoint Kinetics @ 1-855-435-4301 for further assistance.

Please remember to fully read through all instructions and to only use tools that Crosspoint Kinetics has approved. When reconnecting any connector be sure to use Dielectric grease to protect harnessing and connectors from the elements.

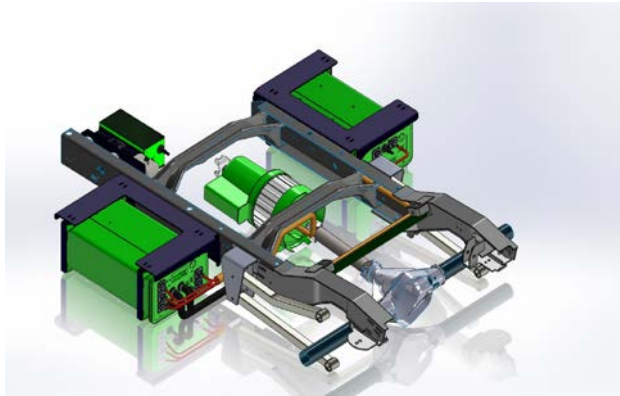
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REVISION RECORD						
REV	DCN	DESCRIPTION	BY	CHECKED	APPROVED	DATE
01	CN 0027	Initial Release	FJ		WAB	03/08/13
02	CN 0072	First update	LB		WAB	11/21/14

Printed versions of this document are not controlled

Before starting – Make sure the vehicle ignition is OFF, transmission in PARK and parking brake ON. Emergency palm switch pressed in disabling Ultra capacitors.



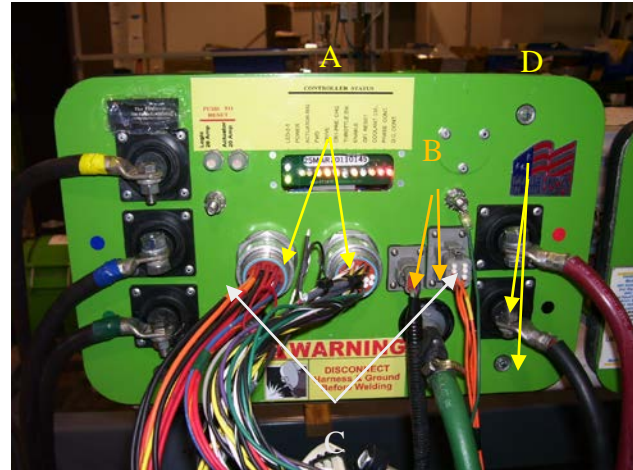
- I. **Hybrid Controller – (If replacing)** Locate the hybrid controller, usually on the driver side of the vehicle. Reference the picture below for orientation. Note: Before removing original controller – locate motor calibration data on motor label. If motor data is not available, this can be read from the controller using the calibrator program.
 1. **Motor Phase Cables** – Using the same hardware removed during disassembly, install the motor phase cables using the cable sealing boots and other hardware. Note position of the (3) cable ring terminals with yellow, blue and green tape labels. Slide a small hose clamp, sealing boot- small end first and large hose clamp onto each of the (3) cables (see picture below). Note – boot is shown cut away only for illustration



2. **Phase terminal connection process** – Locate the BLUE terminal. Push the sealing boot back approx. 4". Use scotchbrite abrasive pad to polish both terminals. Apply a thin film of NO-OX-ID electrical contact grease onto both terminals. Place the BLUE cable terminal on the center terminal marked BLUE and with the captive 12 mm bolt. Install a coned Belleville washer with the small end up, flat washer, split lock washer and nut.

Keep the cable and terminal within 20 deg. Of straight as shown. Torque the nut until the split lock washer is flat and the Belleville washer is compressed to maintain torque. Repeat this process for the yellow and green terminals, using the 3/8" bolt, Belleville washer, flat washer, lock washer and nut supplied. After all (3) ring terminals are tight, slide the boots forward and snap the boot flange into the black insulator on the hybrid controller panel. Note that the small end of the boot must be centered on the 1" dia. Hose on the cable. Adjust this position if required. Tighten the large and small hose clamps to compress the boot to seal. Note that this **MUST** be a watertight seal or the hybrid GFI will keep tripping the system OFF in wet weather.

- A. **Main harness connectors (2)** – Locate round silver body connector that has the larger terminals - the power connector. Plug this into the left socket and lock with a ¼ turn. Repeat this for the right connector. Note that these connectors are keyed and cannot be plugged into the wrong socket.
- B. **Gray Connectors (2)** – Align the connector keys. Press the connectors into the mating socket on the controller front panel until the latches click and the connectors are fully seated.
- C. **Chassis Grounding Straps** – Connect BOTH braided ground straps from the two (2) grounding studs on the front panel of the controller. Tighten the nut to retain.
- D. **Power Cables** – Using the same hardware removed during disassembly, install the power cables using the cable sealing boots and other hardware. Locate the (2) cable ring terminals with RED and Black tape labels. Slide a small hose clamp, sealing boot- small end first and large hose clamp onto each of the (2) cables (see picture above).
- E. **Power cable connection process** – Locate the RED terminal. Push the sealing boot back approx. 4". Use scotchbrite abrasive pad to polish both terminals. Apply a thin film of NO-OX-ID electrical contact grease onto both terminals. Place the RED cable terminal on the top terminal marked RED and with the captive 12 mm bolt. Install a coned Belleville washer with the small end up, flat washer, split lock washer and nut. Keep the cable and terminal within 20 deg. Of straight as shown. Torque the nut until the split lock washer is flat and the Belleville washer is compressed to maintain torque. Repeat this process for the BLACK terminal, using the 3/8" bolt, Belleville washer, flat washer, lock washer and nut supplied. After all (2) ring terminals are tight, slide the boots forward and snap the boot flange into the black insulator on the hybrid controller panel. Note that the small end of the boot must be centered on the 1" dia. Hose on the cable. Adjust this position if required. Tighten the large and small hose clamps to compress the boot to seal. Note that this **MUST** be a watertight seal or the hybrid GFI will keep tripping the system OFF in wet weather.



- F. **Check the cooling hoses** for tight, leak free connections
- G. **Calibration is required after controller replacement.** (see hybrid system test and calibration)

II. Energy Storage Module – Ultra Capacitor Assy. (If replaced)–



1. **Power Cables** – Using the same hardware removed during disassembly, install the motor phase cables using the cable sealing boots and other hardware. Locate the (2) cable ring terminals with RED and Black tape labels. Slide a small hose clamp, sealing boot- small end first and large hose clamp onto each of the (2) cables (see picture above).
2. **Power cable connection process** – Use the same process as 1.g.
3. **Two gray connectors (2)** – Align the connector keys. Press the connectors into the mating socket on the controller front panel until the latches click and the connectors are fully seated.
4. **Chassis Grounding Straps** – Connect ALL braided ground straps from the one grounding stud on the front panel
5. **Check the cooling hoses** for tight, leak free connections
6. PULL OUT the red emergency stop palm button
7. **No calibration is required if only the Ultracap is changed.**

III. Motor Assy. in driveshaft –



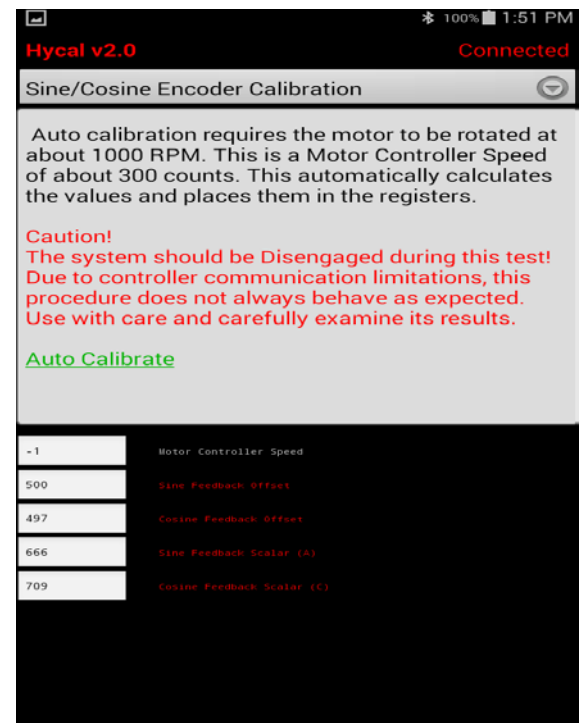
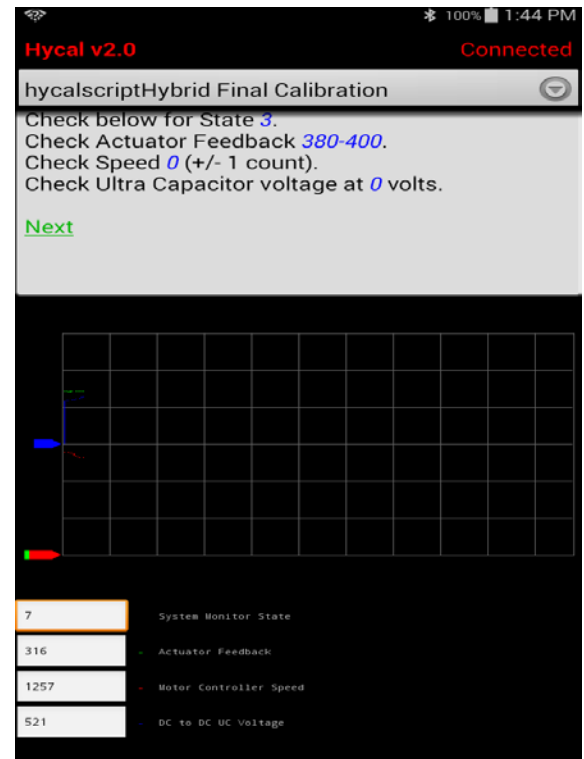
1. **Two gray connectors (2)** – Align the connector keys. Press the connectors into the mating socket on the controller front panel until the latches click and the connectors are fully seated.
2. **Actuator motor connector** – Align and insert connector on the orange and black motor wires until the latches click.
3. **Chassis Grounding Straps** - Connect ALL braided ground straps connecting the motor to clean metal on the vehicle frame
4. **Check the cooling hoses** for tight, leak free connections
5. **Main Hybrid Harness and Jumpers** – Follow the harness from the controller, to the motor and driver station and push together EVERY connector to make sure it is fully seated.

IV. Additional Reconnection Notes after change is complete –

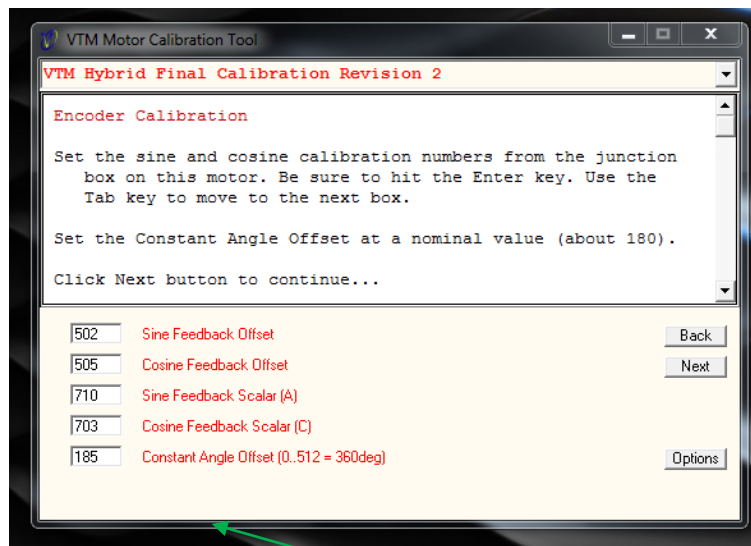
1. Follow this procedure in the reverse order to reconnect
2. Make sure connector latches and alignment pins are in the correct position – Do Not force connectors
3. Connect and tighten all ground strap connections
4. Calibration is required after motor change (**see hybrid system test and calibration**)

V. Hybrid system test and calibration–Laptop

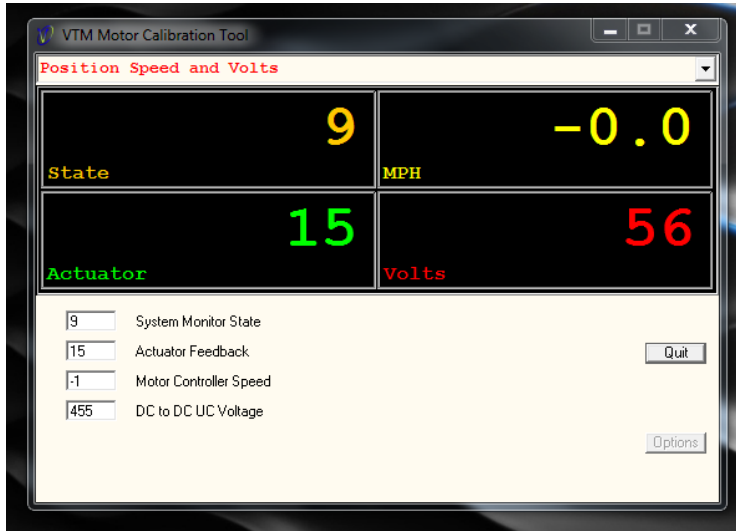
1. Recheck that all connectors are installed and latched
2. Make sure the red palm button on the energy storage module is pulled out
3. Push down on the red top of the inertial switch located behind the drivers seat to reset.
4. Connect a laptop PC and serial cable to the serial port in the hybrid harness – close to the driver panel. Use the Calibrator program to monitor the startup and operation of the hybrid system.
5. **Hybrid switch in OFF position.**
6. Turn ON vehicle ignition and start engine or use battery charger (this will keep 12 volts up)
7. Connect laptop or Bluetooth device and start Calibrator.
8. Depending on version of controller you may have to go to special registers screen to allow writes for saving parameters.
9. Go to the top menu item, press ‘N’ once, and type in the four motor numbers (see label on motor) in the Sine-Cosine blocks. Press ‘Enter’ after each block is filled in. “Tab” to next block. Note the ‘Constant Angle Offset’ block.
10. The CAO number should be about 185. If within 10, do not change. Press ‘U’ or ‘D’ on keyboard until the ‘Options’ button is not ‘grayed’ out. Click ‘Option’, click EEprom Write.
11. This save process takes about 30 seconds and a pink window will appear indicating save is complete.
12. **Select the “Position, speed and volts” screen in calibrator.** The actuator position should read 370-400 – indicating that the hybrid is disabled and in the “Highway” position.



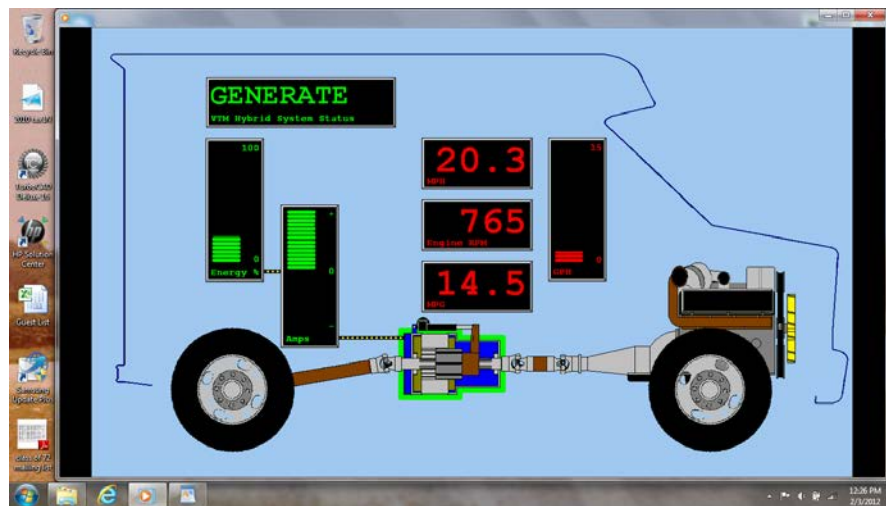
13. Turn hybrid driver panel switch ON – after 1-5 sec. the green LED should stay ON to show the system is ready and the actuator position should change to a 0-20 position reading. The system state should be 9.
14. IF the hybrid does not enable and the red LED continues to flash, the enable string has an open circuit. Recheck inertial switch pressed IN, hybrid switch ON, red palm button pulled out, then recheck all connectors fully latched. Additional troubleshooting information at www.crosspointkinetics.com/techdocs.
15. Monitor the **“Position, speed and volts” screen in calibrator.**
16. Test drive the vehicle to verify the hybrid operates.
17. With the vehicle moving at less than 30 mph, take your foot off the accelerator pedal – the green LED should flash and regen braking should be noted.
18. After several decelerations, when the vehicle accelerates from a stop, the green LED should flash and hybrid torque boost should be noted to help the vehicle accelerate.
19. Close Calibrator and open Animation program and perform the following test.
 - a. Balancing the Kinetics Boost/Regen cycle with the Bus Animation Program
 - b. Required after changing a motor or controller
 - c. The Constant Angle Offset (CAO) parameter used in balancing the Boost/Regen is found on the same page as the Sine/Cosine parameters. (Opening page of Calibrator and ‘Next’ one page).



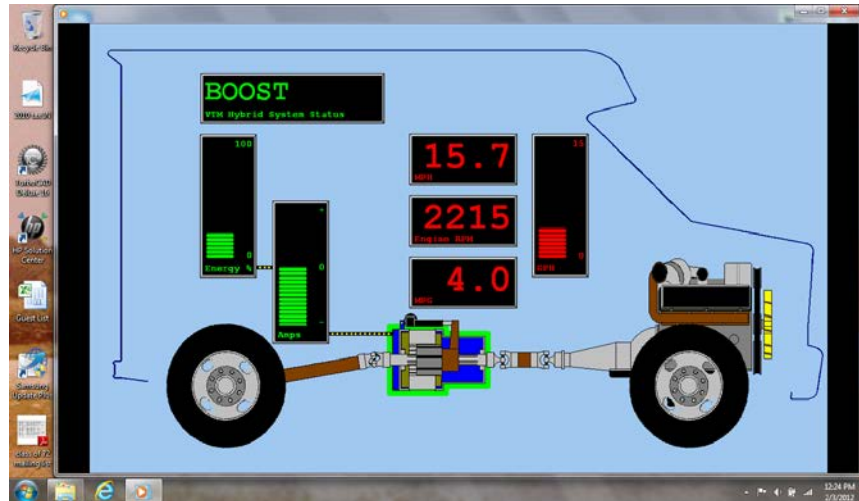
- d. It's usually set to a nominal value of 185. If it's a different number, you can change it to 185 and save it. (Type in 185, press 'Enter', click 'Options', click 'Eeprom Write' with hybrid driver switch off)
- e. Verify the hybrid is operating by changing screen to the 'Position, Speed and Volts' page.



20. Drive the vehicle and watch the voltage changing up and down. Voltage will go up in Regen and State will be 7. If voltage is greater than 55 volts, voltage will go down in Boost and State will be 6. This will verify the basic operation of the hybrid.
21. Balancing the Crosspoint Boost/Regen cycle with the Bus Animation Program
22. Close Calibrator and start the Bus Animation program. We will be using the green graphs on the left side of window. The far left graph is the UltraCap storage (0-100%). The green graph to the right is the amperage going in or out of the UltraCap (0-500a). The center of this graph is 0.



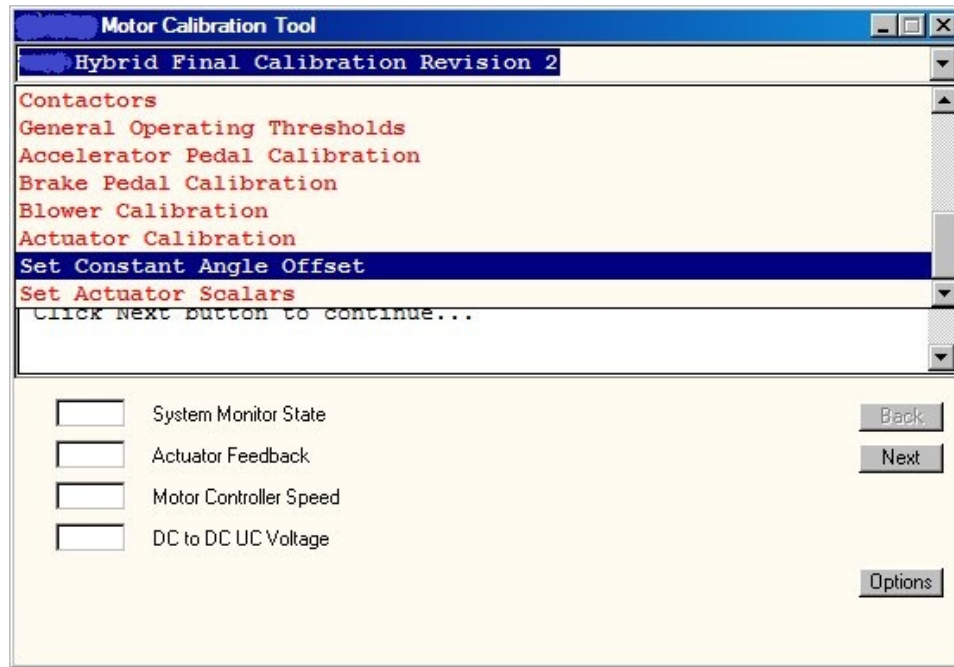
23. In this picture, the bus is in Regen, decelerating and below 30 mph. Note initially, for just a couple of seconds, the amps are maxed out at 500 amps. This is what you are trying to achieve with COA number. Drive the bus to check Regen (foot off pedal and below 30 mph). You should be able to fill the UltraCap from 0% to near 100% full with one coastdown from 30 mph.



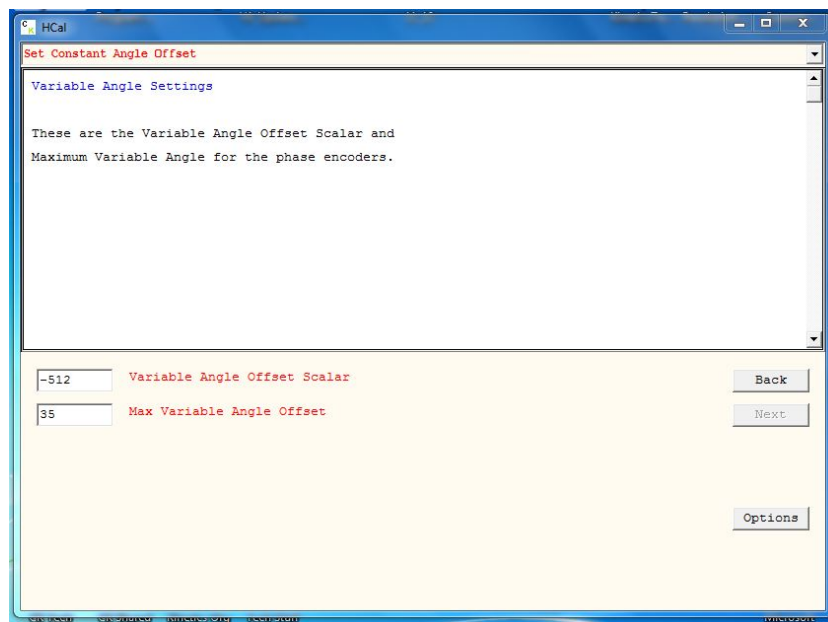
24. In this picture, the bus is in Boost (acceleration) from a full stop and the amps are maxed out again, but only for a couple seconds. This is the desired result. With a UltraCap at 100%, the Boost mode will nearly use all the available storage up at 30 mph.
25. Balancing the Kinetics Boost/Regen cycle with the Bus Animation Program
26. This is how you adjust the COA:
27. Note: If you need to go back into Calibrator to adjust any parameter, close Bus Animation with the 'Close' button. Turn off the bus completely (key off), wait 5 seconds and turn bus back on.
28. If Boost is not maxing out but Regen is: Adjust CAO UP. Start with 5 counts ($185 + 5 = 190$)
29. If Regen is not maxing out but Boost is: Adjust CAO DOWN. Start with 5 counts ($185 - 5 = 180$)
30. You can adjust CAO with any number (1, 2, 3, 4, and 5) Do not adjust each time more than 5. Generally, you will end up adjusting 10 counts or less to get the desired result. Drive bus to check result of adjustment.
31. Try to end up with the Amp graph maxing out the amps for each Boost/Regen event.
32. Note: It is not possible to adjust one without affecting the other.

Installing the Turbo Boost parameters.

33. From the drop down arrow in the upper right side, go to the Set Constant Angle Offset screen near the bottom of the list.



34. Select - Set Constant Angle Offset
35. The Constant Angle Offset number should be about 185 plus or minus 10-15 counts established from the original calibration process. Do not change.
36. Push the "N" key 2 times until the parameter labels in Red are: Variable Angle Offset and

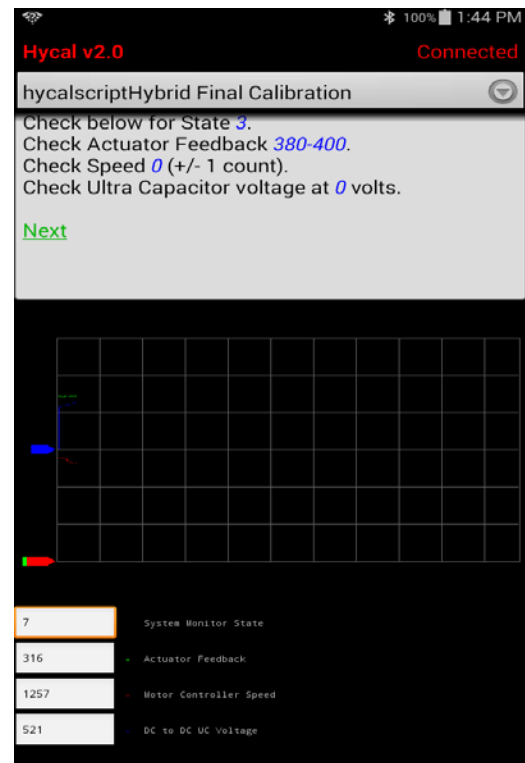


37. Enter the number -512 (minus sign) into the Variable Angle Offset box. The numerals will be red. Push Enter - the numerals should turn Black.
38. Enter the number 35 into the Max Variable Angle box. Push enter - look for same color change.
39. Then click Options.
40. Then click EEPROM Write and wait for about 1 minute until the saving parameter sequence is complete.

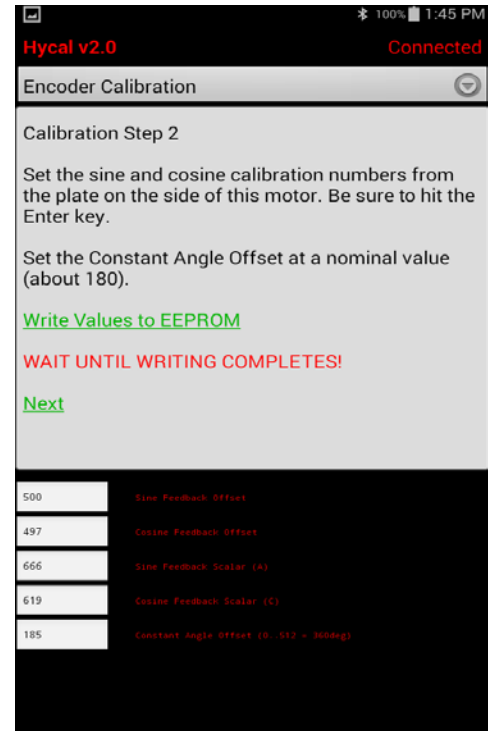
It is important to note that the android app functions differently than the laptop application.
Be sure to go through the complete Hybrid calibration after any major components

- VI. When this upgrade procedure is complete, the bus should be taken for a test drive where there is room to accelerate up to 25-30 mph, and decel to zero speed, several times. There will be a noticeable difference during acceleration and deceleration. The important difference will be the improvement in fuel savings performance. If any of the factors above still unclear please contact Crosspoint Kinetics.

1. Each screen will prompt you to do the calibration through instructions.
The first instructions is to disable the system then check the parameters below.



2. Next step is encoder calibration. This step is to be sure that the motor values are entered into the controller. They can be found on the side of the motor near the serial number. Is not call Crosspoint Kinetics.



Hycal v2.0 Connected

Encoder Calibration

Calibration Step 2

Set the sine and cosine calibration numbers from the plate on the side of this motor. Be sure to hit the Enter key.

Set the Constant Angle Offset at a nominal value (about 180).

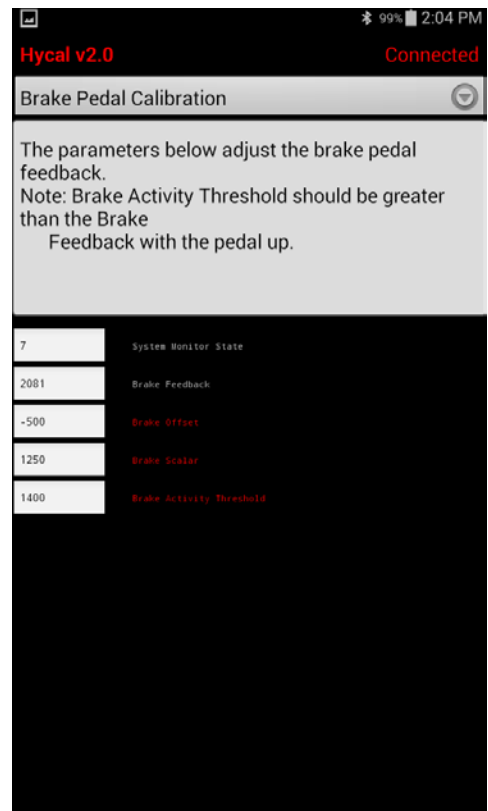
[Write Values to EEPROM](#)

WAIT UNTIL WRITING COMPLETES!

[Next](#)

500	Sine Feedback Offset
497	Cosine Feedback Offset
666	Sine Feedback Scalar (A)
619	Cosine Feedback Scalar (C)
185	Constant Angle Offset (0 - 360deg)

3. Each page is another part of the system to check and verify settings. The Brake calibration page your check that with foot off the brake your value is below 1400 or zero.
 Brake scalar is to be set to 30,000
 Brake activity threshold 1,400
 Your brake activity when pressed should be between their values when pressed.



Hycal v2.0 Connected

Brake Pedal Calibration

The parameters below adjust the brake pedal feedback.
 Note: Brake Activity Threshold should be greater than the Brake Feedback with the pedal up.

7	System Monitor State
2081	Brake Feedback
-500	Brake Offset
1250	Brake Scalar
1400	Brake Activity Threshold

4. Actuator calibration has to do with the settings for the extension of the actuator these should be correct from the factor but it is good to verify.
5. The other checks page will allow you to check your coolant level as well as throttle switch sensor.

Hycal v2.0 Connected

Actuator Calibration

These are the adjustments for the actuator. Use Down menu item to show more of these parameters.

15	Actuator Feedback
400	Park Setpoint
320	Maximum Normal Setpoint
25	Minimum Normal Setpoint

Hycal v2.0 Connected

Other Checks

Hybrid system will not regenerate with LED On.

If necessary, adjust Offset pot on signal board so that green LED lights with approximately 1/8" of pedal travel. When pedal is released, LED must go Off.

DO NOT ADJUST DEADBAND POT ON SIGNAL BOARD!

Check that Throttle Switch signal changes below with LED.

[Additional Pedal Parameters](#)

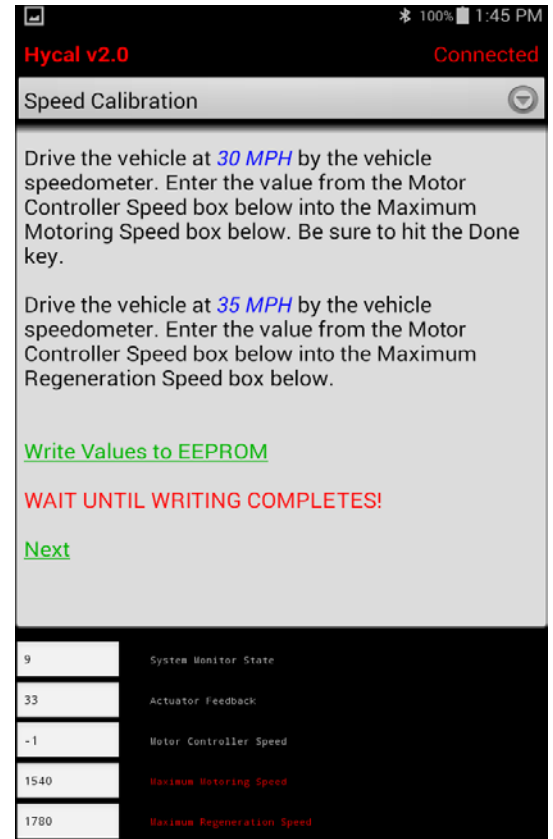
[Write Values to EEPROM](#)

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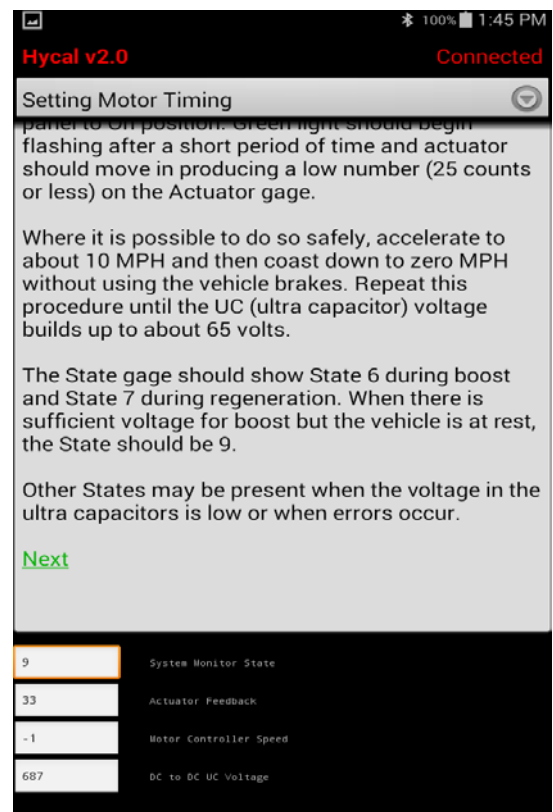
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0	Led 2 (Red 1=On)
1022	Coolant Level (-512=Low)
1	Coolant Float Switch Active (0=Low)
0	Throttle Switch (1)

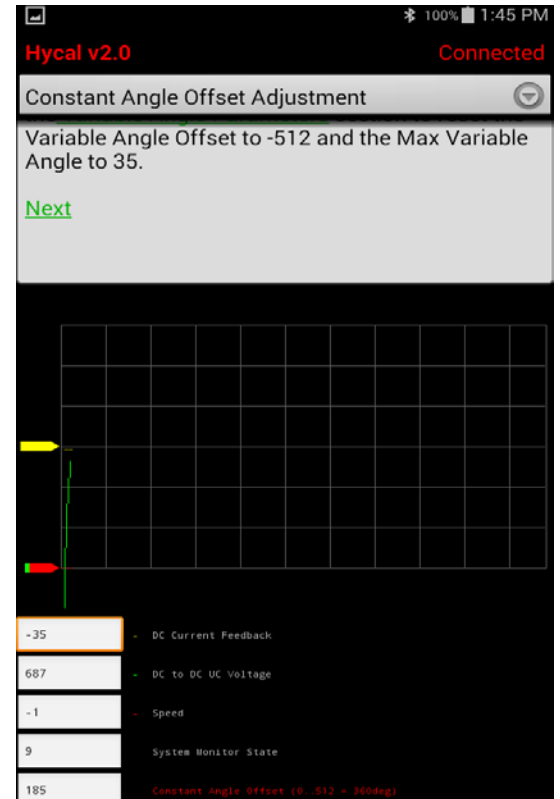
6. Speed calibration page- these settings are to set the 30 MPH speed and 35 MPH. These are the speeds set for regeneration and system for backing off at highway speeds. This process will require someone to drive while another works the calibrator and a safe place to drive at speed.



7. Setting Motor Timing- Follow the prompts to enable the system. Find a safe place to drive up to 10 MPH and then watch for Regeneration and Boost states as posted in instructions.



8. Constant Angle Offset adjustment page will prompt you to check the Regeneration and Boost again also the ensure that the variable angles -512 and 35



9. Dead spot test- Last part of the calibration process is the dead spot test. Again you will have to find somewhere safe to accelerate to 30 mph and then coast to zero. The graph below in this process will show if in Regeneration and boost you are filling the Ultra Capacitors and fully discharging them.

Calibration is finally complete and you should feel the Boost and Regeneration of the system. If at any time any of these instructions are unclear please contact a Crosspoint Kinetics representative. 1-855-435-4301

